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913,759 COMPLETE SPECIFICATION
1 SHEET

This drawing is a reproduction of the Original on a reduced scale.

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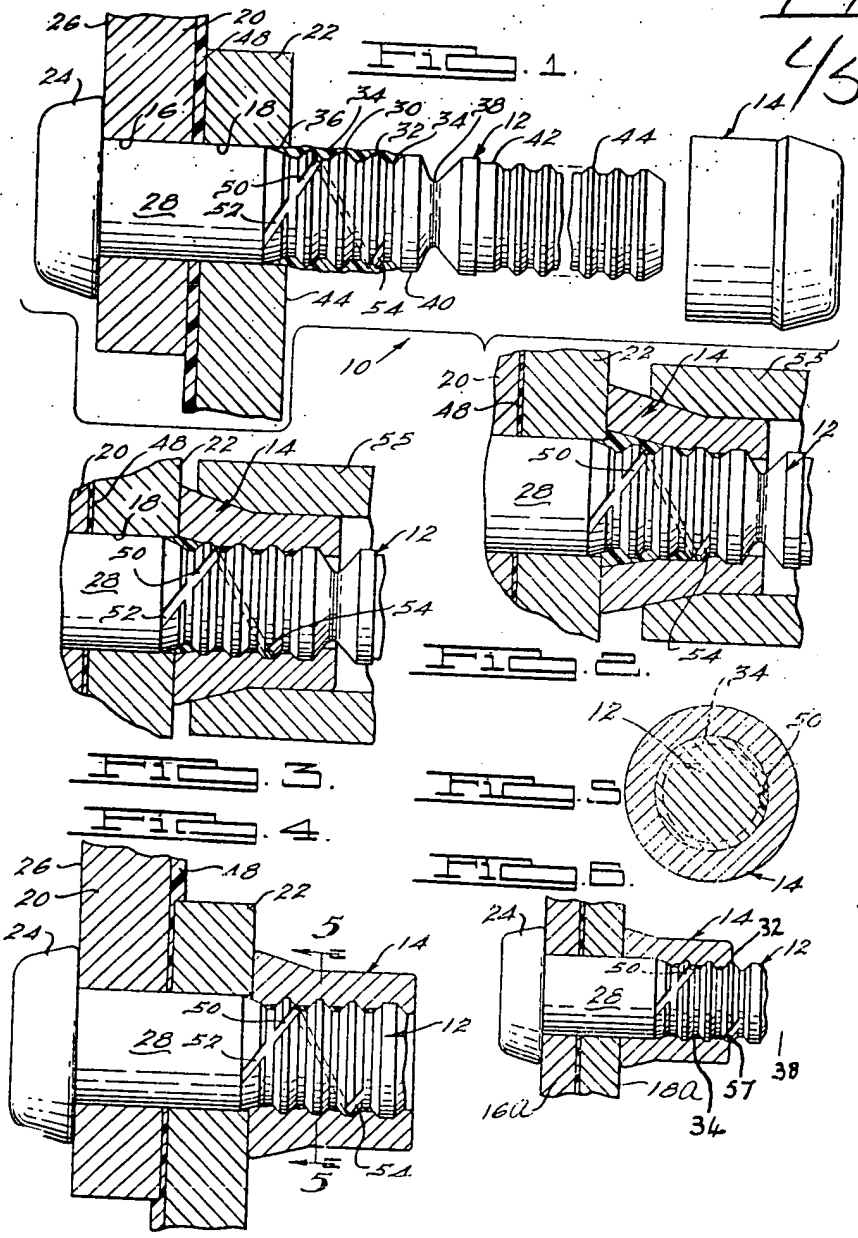

Fig. 1.

Fig. 2.

Fig. 3.

Fig. 4.

Fig. 5.

Fig. 6.

PATENT SPECIFICATION 913,759

DRAWINGS ATTACHED.

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COMPLETE SPECIFICATION.

Improvements in or relating to Rivet-Like Fasteners.

We, HUCK MANUFACTURING COMPANY, a Corporation organised under the laws of the State of Michigan, United States of America, of 2480 Bellevue Avenue, Detroit 7, State of Michigan, United States of America, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates generally to a pin for use in fasteners of the type in which a collar is deformed into interlocking engagement with a circumferentially grooved portion of the pin and more particularly to an improved pin of this type which has a relief groove that prevents trapping of any flowable material in the locking grooves.

The two-part fastener includes a pin having a preformed head adapted to be inserted from one side of the work and a collar adapted to be inserted over the pin at the opposite side of the work. The work usually consists of two or more plate or panel members having substantially aligned openings through which the pin extends. The pin head engages the outside surface of one of the plate members and the collar engages the outside surface of the other plate member and is positioned in substantial radial alignment with a portion of the pin which is formed with circumferential grooves. In some cases, a layer of a sealant, which is of the consistency of paste or a very thick fluid is disposed between the plates and during insertion of the pin through the openings in the plate members, this sealant partially or completely fills the locking grooves in the pin.

A fastener of this type is set by pulling the pin and applying the reaction force to the collar. After a certain pulling force is reached, the collar is locked to the pin by flowing the collar metal into the locking grooves in the pin, after the plates have been pulled tightly together. The end of the collar remote from the pin head, which is the end of the collar first engaged by the swaging tool, is first locked to the pin by flowing the collar metal at this end into the groove at one end of the grooved portion of the pin. This is known as "primary clinch". The swaging operation continues so that the other grooves are successively filled with flowed metal from the collar, ending with a final clinching which provides for a complete swaging of the collar into the locking grooves in the pin and into engagement with the locking lands which define the locking grooves.

The sealant in the grooves can become trapped and prevent an effective flowing of the collar metal into the grooves, and prevent the desired strong interlock of the collar and pin.

In accordance with the present invention there is provided a pin having a portion with annular locking grooves spaced from the head of said pin for use in a fastener comprising said pin and an annular collar positioned about said locking grooves and adapted to be deformed so that portions thereof project into said grooves to provide for an interlocking engagement of the collar and the pin, said pin being provided with a relief groove which traverses said locking grooves. Since the clinching of the collar to the pin begins at one end of the grooved portion of the pin, the sealant or the like in the locking grooves is caused to flow from that end of the grooved portion to the opposite end. Manufacture of the pin with a relief is facilitated by a spiral-shape of the relief groove, and by virtue of its spiral-

[*Price 4s. 6d.*]

shape, any adverse effect of the relief groove on the interlock of the collar and the locking lands is minimized.

The invention will become apparent from a consideration of the following description, the appended claims and the accompanying drawing in which:—

Fig. 1 is an elevation view of the fastener of this invention shown in assembly relation with a pair of plate or panel members which are to be connected by the fastener;

Fig. 2 is a fragmentary sectional view showing the relative positions of the pin and collar in the fastener at the time the collar is initially clinched to the pin and showing a maximum grip condition of the fastener;

Fig. 3 is a fragmentary sectional view similar to Fig. 2 showing the pin and collar in an intermediate clinch position;

Fig. 4 is a fragmentary sectional view similar to Figs. 2 and 3 showing the pin and collar in a final clinch position;

Fig. 5 is a fragmentary sectional view looking substantially along the line 5—5 in Fig. 4; and

Fig. 6 is a fragmentary sectional view similar to Fig. 4, showing the fastener in a minimum grip condition.

With reference to the drawing, the fastener indicated generally at 10, is illustrated in Fig. 1 as including a pin 12 provided with a collar 14. The pin 12 is illustrated in Fig. 1 extending through a pair of aligned openings 16 and 18 formed in a pair of plate or panel members 20 and 22, respectively, which are to be connected with the fastener 10.

The pin 12 is provided with an integral preformed head 24 adapted to engage the adjacent face 26 of the plate member 20 with the pin extending through and beyond the openings 16 and 18. The pin 12 has a cylindrical hole-filling portion 28 adjacent the head 24 and a grooved portion 30 illustrated as having three annular ribs or lands 32 with grooves 34 between adjacent lands 32. The grooves 34 adjacent the hole-filling portion 28 is separated from the portion 28 by an inclined shoulder 36 to provide a vent for the end groove 34. It is to be understood that more or less lands 32 may be provided depending on the specific use for which the fastener 10 is intended. The outer diameter of the lands 32 is slightly less than the outer diameter of the hole-filling portion 28.

The pin has a breakneck groove 38 adjacent the end groove 34 remote from the hole-filling portion 28 and this breakneck 38 represents the weakest part of the pin 12 so that the pin will break under tension at this point before it will break under tension at any other point. The breakneck groove 38 is separated from the adjacent locking groove 34 by a land 40 which is slightly wider than the locking lands 32. The pin has a cylindrical portion 42 next to the breakneck 38 which is of a slightly smaller diameter than the lands 32 and terminates at its outer end in a grooved or gripping stem portion 44 which is elongated relative to other portions of the pin 12.

The second part of the fastener 12 consists of the collar 14 which is received over the end of the pin 12 and is located against the adjacent face 44 of the plate 22 as illustrated in Fig. 2. The collar 14 is adapted to be swaged or contracted radially inwardly into the grooves 34 on the pin portion 30 so as to lock the collar 14 to the pin 12 and form what constitutes a fastener head positioned against the plate 22 in the applied position of the fastener 10. The above described structure of the fastener 10 is well known.

In some instances a sealant material, indicated generally at 48, is applied to the engaging faces of the plates 20 and 22 prior to assembly of one or more fasteners with the plates. A sealant material of this type, which is of the consistency of a very thick fluid, or in some cases is of a pasty, sticky consistency, is used to seal portions of the plates between the fasteners which are used to connect the plates. When the pin 12 is initially inserted through the plates 20 and 22 some sealant adheres to the grooved portion 30 of the pin and during swaging of the collar 14 onto the grooved portion 30, the sealant 48 becomes trapped in the locking grooves 34 so as to prevent flow of the collar material into the grooves 34 to the extent necessary to provide a strong interlocking engagement of the collar 14 and the pin 12.

Accordingly, the pin 12 of this invention is provided with a spiral relief groove 50 which extends longitudinally of the pin 12 about the groove portion 30. One end 52 of the groove 50 terminates at the hole-filling portion 28 and the opposite end 54 terminates at the groove 34 adjacent land 40. As shown in Fig. 5, the groove 50 is of a depth corresponding to the depth of the locking grooves 34 to thereby provide for a full fluid communication of the grooves 34.

During swaging of the collar 14 onto the grooved portion 30, when the fastener 10 is being applied in a maximum grip condition, namely, when the plates 20 and 22 are of a combined thickness equal to the maximum thickness for which the fastener 10 is intended, the collar material adjacent the collar end 56, which is the end initially engaged by the swaging tool indicated at 55, is first flowed into the locking groove 34 adjacent the breakneck groove 38 to initially clinch the collar 14 to the pin 12. Most of the sealant in this locking groove 34 is thus squeezed out of the groove 34 through the relief groove 50 into the adjacent groove 34, the only sealant remaining in the end groove

34 being that at the bottom of the groove which the collar material does not displace. When the swaging of the collar 14 has been continued so that the collar is in an intermediate clinch condition as shown in Fig. 3, the collar material has been deformed into the next locking groove 34 and most of the sealant therein flows through the relief groove 50 to the next locking groove 34. It can thus be seen that as the swaging operation continues, the sealant in the locking grooves 34 is progressively moved toward the end groove 34 adjacent the hole-filling portion 28 from which the sealant flows out around the collar 14 and along the inclined vent shoulder 36 into the openings 16 and 18.

In the minimum grip condition of the fastener 10 illustrated in Fig. 6, in which the fastener is utilized to connect plates 16*a* and 18*a* which are of a combined thickness corresponding to the minimum thickness for which the fastener 10 is designed, the outer end of the collar 14 is located substantially at the locking land 32 adjacent the breakneck groove 38. Consequently, during swaging of the collar 14 onto the pin 10, some of the sealant in the locking grooves 34 can be forced through the relief groove 50 to the end 54 thereof.

From the above description, it is seen that this invention provides a relief passage 50 in the locking groove portion 30 of the fastener pin 12 to prevent trapping of any sealant, or any other flowable material which may be present in the locking grooves 34. Since the relief groove 50 is of a depth to extend to the bottoms of the grooves 34 which is radially inwardly of the flowed collar material, the grooves 34 are always in communication with each other for flow of excess fluid from one to the other. Manufacture of the pin 12 with a relief groove is facilitated by the spiral-shape of the groove 50 which is readily formed by including a rolling die with straight inclined teeth in the die in which the locking grooves 34 are rolled in the pin 12. However, the groove 50 can also be formed in the pin 12 by other methods such as by cutting the groove 50. At the intersection of the groove 50 with each land 32, the land of course does not interlock with the collar 14. However, by forming the groove 50 of a spiral-shape the adverse effect of the groove 50 on the interlock of the lands 32 with the collar 14 is uniformly spread around the circumference of the collar so that overall loosening effect on the lock of the collar is minimized.

WHAT WE CLAIM IS:—

1. A pin having a portion with annular locking grooves spaced from the head of said pin for use in a fastener comprising said pin and an annular collar positioned about said locking grooves and adapted to be deformed so that portions thereof project into said grooves to provide for an interlocking engagement of the collar and the pin, said pin being provided with a relief groove which traverses said locking grooves.

2. A pin according to Claim 1, in which the relief groove is in the form of a spiral communicating with each of the locking grooves.

3. A pin according to Claim 1 or 2, in which the relief groove has the same depth as the locking grooves, which also have substantially uniform depth.

4. A fastener which includes the pin and annular collar according to any one of the preceding claims which collar is of a length corresponding substantially to the length of the grooved portion of said pin and which is applied to the pin by first deforming one end of said collar so that it projects into one of said locking grooves at one end of said portion, and subsequently deforming successive portions of said collar located closer to the opposite end thereof, so that said collar portions extend into other ones of said locking grooves.

5. A pin and collar or a fastener comprising same substantially as herein described with reference to the accompanying drawings.

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